SEPTEMBER 1960

Soil Conservation

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"What now remains of the once rich land (of Attica) is like the skeleton of a sick man, all the fat and soft earth having wasted away, only the bare framework is left."

—PLATO
380 B. C.

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COVER PICTURE.—Orchardgrass and Ladino clover pasture in Northumberland County, Pennsylvania.

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

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TOM DALE, Editor

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Hay Production Increased 7-fold, Cattle 10-fold

By Tom Turner

REPLACEMENT of native meadow grasses with alfalfa and improved grasses and more efficient water use are enabling John Rutman to produce seven times as much hay on his Devil's Gate Ranch near Elko, Nevada.

When Rutman purchased the ranch in 1949, he cut 450 tons of meadow hay from 1,000 acres. Now he averages 3,000 tons from 800 acres. In 1949, the ranch was supporting 260 head of cattle, but now Rutman runs between 2,000 and 3,000 head.

Rutman recalls that after he had had his better hay production program underway for a couple of years a native old-time cowman neighbor stopped by the ranch. "John, I sure hate to see you plow up those meadows," the neighbor commented. "Elko County was built on them, and its a mistake to bust them out. You're just pouring your money down the drain," the old cowman argued.

The neighboring rancher visited the Rutman ranch again in recent years, and observed the numerous huge stacks of baled hay. "John, I'll have to admit you were right about breaking out the native meadows for alfalfa and new grasses," he commented. "Those big stacks of hay sure are a pretty sight."

Rutman's ranch includes 16,600 acres of deeded land, and grazing rights on an additional 100,000 acres of public land. His privately owned land includes a strip about a mile wide and more than 20 miles long.

After cutting his first meadow hay crop in 1949, and getting only 450 tons from 1,000 acres, Rutman decided that he needed to change to higher producing crops, and to make better use of water so he could produce more feed for more livestock.

"Where I came from cattle didn't like sagebrush, and I didn't think they liked it here," Rutman says. "I believed that my 3,000 acres of bottomland, coupled with a good source of water, would produce the feed I wanted, but I needed technical assistance," he recalls.

Rutman became a cooperator of the Starr Valley Soil Conservation District, and SCS technicians assisting the district made soil survey and topographic maps for him. Then they helped him develop a conservation plan for the entire ranch.

"SCS engineer Hugh Rossolo and soil scientist Don Bagley of Elko were particularly helpful in getting me started off right on a complete soil and water conservaton program," Rutman says.

In order to increase his water supply, Rutman drilled a 350-foot well in 1951. The well, which has a 16-inch casing, pumps around 2,000 gallons a minute. During the spring the well flows from artesian pressure, but most of the time the

John Rutman (center) and cowboys vaccinate one of the Rutman calves.

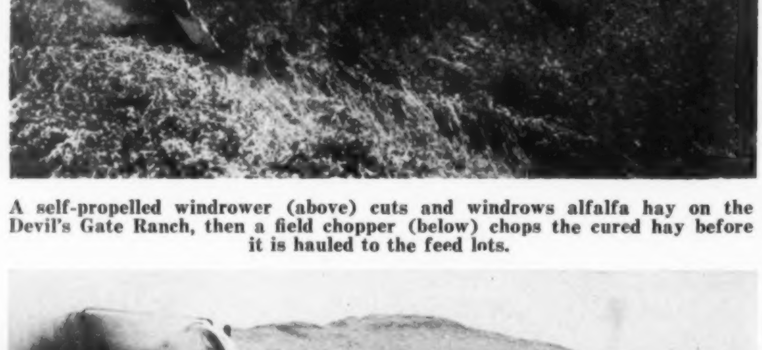
Note:—The author is work unit conservationist, Soil Conservation Service, Wells, Nev.

water stands around 25 feet from the surface.

Rutman further increased his water supply in 1955 when he dug a sump 250 by 350 feet in area, which is filled by ground water. The sump yields around 1,000 gallons a minute, so the combined yield of the well and sump is between 6 and 7 cubic feet per second. Rutman is now installing 1,260 feet of 8-inch pipe from the well to a high line ditch about 12 feet higher than the well surface. This will enable him to irrigate the higher areas of the meadows.

The irrigation system on the Devil's Gate Ranch includes about 45 miles of canals, and numerous water control structures. Around 800 acres have been leveled for more efficient irrigation, from 50 to 100 acres being leveled each fall. Between 400 and 500 acres remain to be leveled. Border ridges are used to obtain better efficiency in water use.

A self-propelled windrower (above) cuts and windrows alfalfa hay on the Devil's Gate Ranch, then a field chopper (below) chops the cured hay before it is hauled to the feed lots.



Most of the conservation work on the ranch has been done by the employees with SCS providing the necessary technical assistance. Last fall, for the first time, 70 acres of land leveling was contracted at a cost of 14 cents a yard of earth moved. Rutman feels that at this price he cannot afford to do the work himself. The average cost of the land leveling had been $65 an acre.

Rutman believes in using his raw product, hay, to produce finished beef. He supplements the hay with barley and other grains in pellet form. He operates a feedlot to finish out both heifers and steers. The cattle go into the feedlot after weaning early in December at an average weight of 375 pounds.

The lighter 60 to 70 percent of the calves are turned in the open range around April 15. The remaining 30 to 40 percent are finished to weigh about 1,000 pounds when sold in October. The lightweight yearling steers and heifers are gathered from the range late in July, and are put in the feedlot and finished. These are sold in late winter weighing about 1,000 pounds.

The average rainfall in the area is 8 to 9 inches, but was only 4 to 5 inches during the drought year of 1959. That year only a fourth of the 800 acres in alfalfa received more than one good irrigation. Hay production was about 2,000 tons, considerably below the 3,000-ton average, as a result of the drought.

Rutman usually irrigates and cuts 1,500 to 2,000 acres of native meadow hay in normal rainfall years, but last year only 500 acres were cut with a yield of 250 tons. "If I hadn't had alfalfa and tame grasses, I wouldn't have produced much hay last year," he says.

Many ranchers in the area had to reduce their herds and buy hay as a result of the drought. Grazing on the public range was especially poor. A lot of cattle put on the range last spring came off in the fall with less weight. Rutman sold around 700 weaners, yearlings, and cows because of the condition of the public range.

"The soil and water conservation program is the greatest thing that has come to farmers and ranchers in this country," declares John Rutman. "The trouble is that too many are sticking to the methods used by their forefathers instead of adopting modern practices."

Land leveling operations on the Rutman ranch.

More Stock Watering Places

By Mark E. Hill

LIVESTOCK now find it easier to get a drink of water on the ranges of the North Bingham Soil Conservation District, simply because there are more watering places.

Sid Balmforth, the district "Cat skinner," spent a good part of last summer in the hills developing water supplies, using the district carryall and bulldozer. He took the equipment to the hills to build three stock ponds. Before he got back he built 8 new ponds and rebuilt 10 more that had washed out or were so filled with silt they were useless. He also assisted with two spring developments.

Jack Klossner helped out by bringing in a back-hoe and developing springs for George Hansen and the Eastern Idaho Grazing Association.

Each new pond was surveyed and designed by Soil Conservation Service technicians to hold enough water to provide for the needs of the cattle which would graze in the area.

Balmforth built the ponds to specifications, with a minimum top dam width of 8 feet and a 2 to 1 slope on the downside and 3 to 1 slope on the water side. An ade-

Note:—The author is work unit conservationist, Soil Conservation Service, Shelley, Idaho.

Sid Balmforth with his pond-building equipment in the North Bingham SCD.

quate spillway was installed to protect the dam from washing out and to establish a minimum depth of 6 feet. Lack of spillways was the cause of failure of the dams that needed rebuilding.

Balmforth's first step was to bulldoze off all the overburden, consisting of topsoil and organic materials, to below the dam site area. After the dam was completed, Balmforth pushed this overburden up against the fill on the downside.

A clay core was built across the channel and packed with the carryall. The clay core is necessary to hold the water. Sites were always selected where clay was available.

The clay core and an adequate spillway are the key to success with stock ponds.

"Sid sure knows how to build those ponds," E. C. Geisler said as he told me of his plans to have Balmforth build three more for him next year. Many ranchers have made similar remarks as they saw the newly built or reconstructed dams while making roundups in the area.

Cost per pond ranged from $260 to $325 with ACP sharing about one half of the cost of the 8 new ponds.

Springs were developed by George Hansen and by the Eastern Idaho Grazing Association. Springs have an advantage over ponds in that the water stays clear and clean—even suitable for man to drink. But they often are more expensive. One of the Eastern Idaho Grazing Association spring developments cost about $1,400.

These springs were developed by digging a trench about 5 feet deep through a bog area. Tile or concrete pipe was laid to collect the water. Clean gravel was packed around and on top of the tile. A clay core was laid across the drainageway to force all the water into the tile. A 2-inch steel or plastic pipe was connected to the tile, with or without a stilling box. The pipe runs downhill, underground, until an elevation is reached where the pipe can be brought up to empty into a trough by gravity flow.

The whole spring area is covered with rock or fenced with a sturdy pole fence.

"We've needed these water developments for a long time," said George Hansen, a director of the Grazing Association. "We spent a lot on fencing and water this year. But we're not worried. It'll soon pay off."

Jack Klossner (right) and assistant locate an adequate water supply for spring development on Eastern Idaho Grazing Association land.

As of January 1, 1960, cattle numbers in the United States reached a new high of 101.5 million head, an increase of about 5 percent during the year. The increase was in beef cattle, since the number of milk cows declined by 1 percent, to a 43-year low of 21.3 million.

National Grasslands

About 3.8 million acres of public lands were recently designated as "National Grasslands" by the Department of Agriculture. Most of the newly named National Grasslands are in the Great Plains States of North Dakota, South Dakota, Wyoming, Nebraska, Kansas, Oklahoma, Texas, and New Mexico, with smaller acreages in Idaho and Oregon.

These National Grasslands were originally purchased in the 1930's by the Department of Agriculture as a part of the Land Utilization program authorized by the Bankhead-Jones Act. At the time of Federal purchase most of the land had been severely damaged by wind erosion, and the Government purchase was done mainly to check the wind erosion and restore permanent grass cover. The lands were managed and developed by the Soil Conservation Service from 1938 through 1953, at which time they were turned over to the Forest Service for administration.

The Forest Service will continue to manage the National Grasslands in accordance with its multiple-use program, in much the same way it manages National Forests.

EROSION ON PIEDMONT SOILS

By A. P. Barnett and B. H. Hendrickson

THE Southern Piedmont is part of a very ancient land formation extending across northern Alabama, Georgia, and South Carolina and continuing northeastward in a narrower belt into Virginia. The Southern Piedmont originally was a tilted plateau about 150 miles wide, sloping southeastward from the base of the Blue Ridge mountains at elevations of about 1,200 feet, to an elevation of 600 feet at its lower edge, where it dropped abruptly to the 500-foot elevation and joined the upper Coastal Plain.

The Southern Piedmont no longer resembles a plateau. It now is hilly country, deeply dissected by numerous stream valleys with only a few broad ridges of gently sloping land. The soils have developed from weathered granitic rocks. Soils of the Cecil series occupy about 22,000,000 acres, or approximately two-thirds of the area.

On uneroded uplands, the Cecil sandy loam topsoil is about 8 inches deep and is underlain to depths of about 5 feet by red clay subsoil. Below the subsoil to depths of 25 feet or more, porous rotten rock rests on bedrock. Originally the surface soil was grayish-brown in color. Today, most of the soil in cultivated fields is red or reddish, the color of the plowed-up subsoil. The soils of the Cecil series are not naturally very fertile, but they are responsive to good fertilization and management, if not too badly eroded and gullied.

About one-third of the area is forested; the remainder is open land, including cropland, pasture, and idle land. According to soil surveys, 75 percent or more of the uplands have suffered moderate to severe erosion. The most extensive land class is the moderately eroded, moderately sloping Class IIIe land.

Until about 25 years ago, mule farming predominated in this area and produced cotton, corn, oats, and cowpeas. There were few livestock other than mules, and few improved pastures. Tenants and sharecroppers operated 60 percent of the farms.

Rapid changes in agriculture have occurred in the Southern Piedmont during the last two decades. There has been an almost phenomenal increase in the number of livestock on farms, numbers of tractors, and pasture-development work; and substantial increases in the production levels of improved farm crops and products. The percentage of owner-operators has increased sharply as well as the acreage per farm operator. During this period there has been a steady increase in the establishment of conservation farming methods.

No. 57

This is the fifty-seventh of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

The climate is favorable for diversified agriculture—adequate rainfall, a long growing season, and mild winters. The growing season averages seven months between frost dates. Cool-season pasture crops grow two-fifths of the time during winters.

During the past 20 years, research at the Southern Piedmont Soil Conservation Field Station,

Test plots on Class IIIe land at the Watkinsville Soil Conservation Field Station.

Note:—The authors are, respectively, agricultural engineer and soil conservationist, Agricultural Research Service, Watkinsville, Ga.

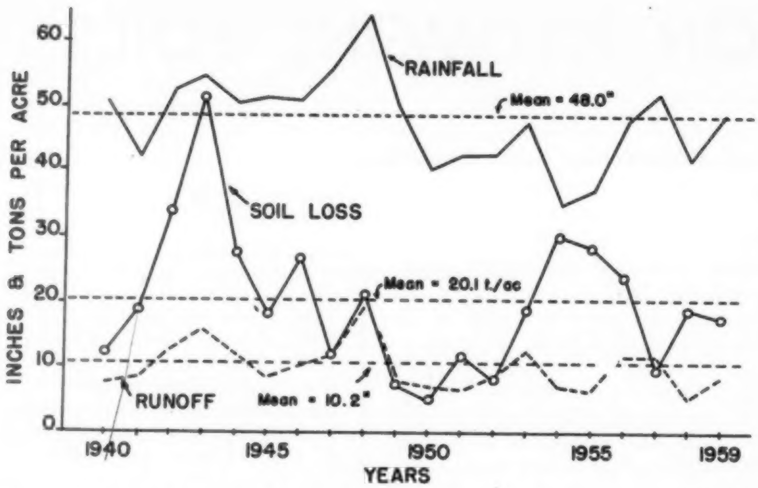


Fig. 1. Annual rainfall, soil loss, and runoff; Class IIIe land, continuous cotton.

Watkinsville, Georgia, has been directed toward the development and testing of practical methods to reduce soil and water losses and restore productivity of the farmlands of the Piedmont. Useful and meaningful data have come from a series of runoff plots on the Cecil soils of 7-percent slope. They represent conditions existing within a 5- to 9-percent slope range, and are typical of the land on which most Piedmont farmers make their living.

The key data on soil and water loss which were used for check purposes came from continuous cotton plots operated for 20 years on Cecil soils, Class IIIe land. Data from these and companion plots form the basis for the following discussion.

The year-to-year erosion hazard —the severity of erosion in different years—has been determined from runoff and soil loss data from continuous cotton plots since 1940. The year-to year variation in soil loss is shown in Figure 1. The maximum annual loss of 53 tons per acre was measured in 1943, while the minimum annual amount, 5 tons per acre, was measured in 1950.

It is of interest to note that during the years when erosion was above the average of 20 tons per acre per year, there was keen public interest in terracing and water disposal systems. In periods like the middle 1940's and early 1950's when erosion was below average, the interest in terraces was slight, and, in fact, many terracing systems on farms were abandoned. An increased interest in parallel terraces during the past 5 years coin cides with an upward trend in soi loss.

What causes the year-to-yea variations in erosion? Figure shows that there is no close rela tionship between amounts of rain fall and erosion, nor between amounts of runoff and erosion. Therefore, to explain the annual variation in erosion, we must look for something other than volume of rainfall or runoff.

Let us examine Figure 2 that shows the seasonal distribution of rainfall, runoff, soil loss, and excessive-rate storms. Both rainfall and runoff have a similar seasonal distribution pattern; but the erosion pattern differs widely—though the erosion and excessive storm pattern are quite similar. This shows that erosion and the frequency of excessive-rate rainfall are closely related.

What is an excessive-rate storm? It can best be described as a "thunderstorm"—the type usually associated with the warmer months, although they can occur any time of the year. A half-inch or more of

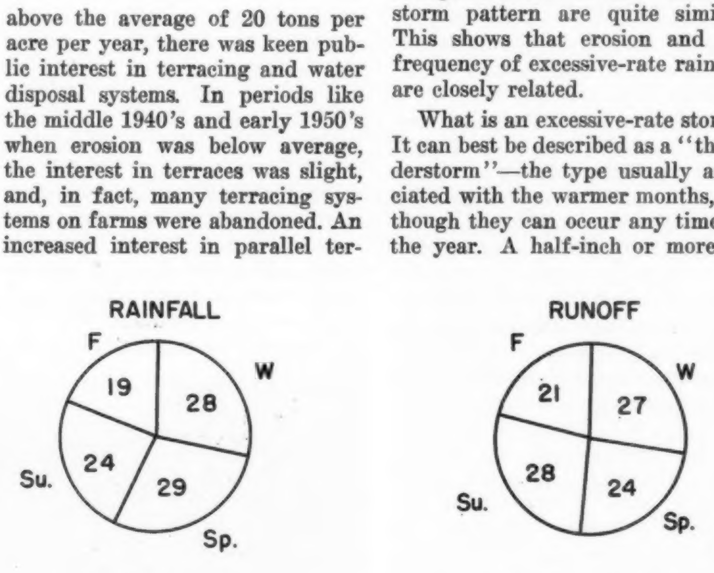


Fig. 2. Seasonal distribution of rainfall, runoff, soil loss, and number of excessive-rate storms.

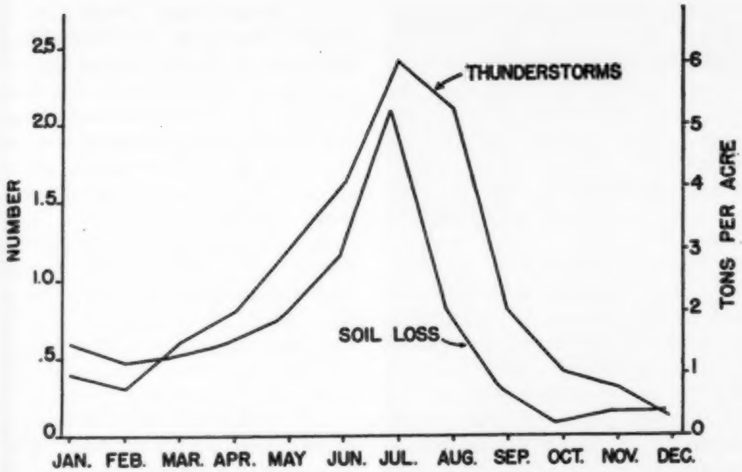


Fig. 3. Average monthly distribution of soil loss and number of thunderstorms.

rain in half an hour is considered an excessive rate.

We have established that the thunderstorm creates an erosion hazard and that it occurs most frequently during the warmer months of the year. The monthly distribution of erosion is shown in Figure 3. July is the most erosive month with August and June in second and third place. The monthly distribution of excessive-rate storms (thunderstorms) is also presented in Figure 3.

Over the last 20 years an average of 11 thunderstorms each year has caused 86 percent of the erosion and accounted for 56 percent of the runoff even though these storms contained only 25 percent of the rainfall. These 11 storms lasted about 2½ hours each on the average, totaling only 28 hours each year, or slightly over one day out of 365.

It may seem fantastic, but it is true that our major erosion problem occurs at intervals that total but little more than one day's time out of 365. These facts are presented in Figure 4.

A considerable range in cropping practices, cover crops, and crop rotations has been tested on the Station's runoff plots. Early in the tests it was found that row-cropping year after year gave inadequate protection even when combined with legumes such as vetch and crotalaria and all crop residues left on the land.

The next step was to design conservation cropping practices that would increase infiltration and reduce soil losses so that the rotation's average soil losses would be low enough to be considered "good conservation." Conservationists consider soil losses of three tons per acre per year to be satisfactory soil conservation on most Piedmont soils.

It was found that the direct protection of summer sod crops was highly effective in reducing soil and water losses. Also, the sod crops produced a surprisingly potent effect after being turned under. In brief, the function of effective sod cover crops includes increasing infiltration and percolation of water into the soil, reducing runoff and erosion, and, when residues have been turned under, improving the tilth, organic-matter content, and productive capability of the soil.

Of the many cropping methods and rotations designed and tested, the most effective ones have been based on volunteering annual lespedeza or tall fescue in rotations with cotton or corn.

A 3-year, lespedeza-based rotation that included (1) oats followed by Kobe lespedeza, (2) volunteer Kobe lespedeza, and (3) cotton followed by oats, was considered effective when used on Class IIIe land. It permitted an average soil loss of 2.6 tons per acre for a 12-year period. When used on Class IVe land with 11-percent slope, how-

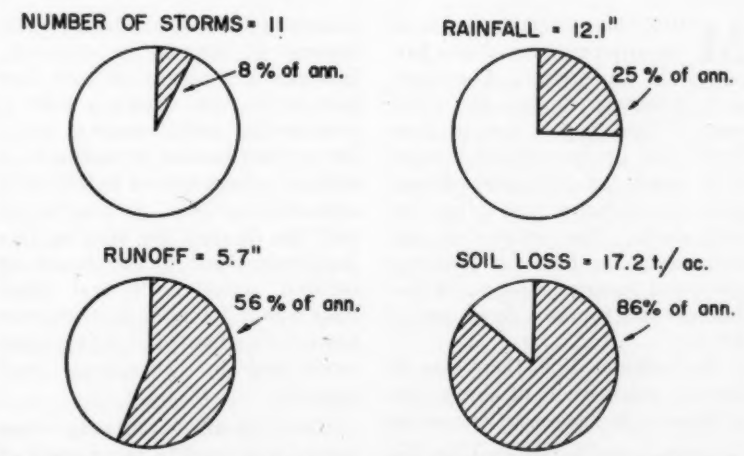


Figure 4. The average number of excessive-rate storms per year and amount and percentage of total rainfall, runoff, and soil loss attributed to these storms.

ever, this rotation permitted an average soil loss of 4.8 tons per acre, which was not considered adequate protection.

A 3-year, fescue-based rotation, consisting of (1) oats followed by fescue and crimson clover, (2) fescue and crimson clover, and (3) corn, was effective for both Class III and IV land. It permitted only .5 ton of soil loss per acre per year on Class III land, and only .8 ton soil loss on Class IV land.

A 4-year, fescue-based rotation, that was the same as the 3-year rotation above except that 1 year of cotton followed the corn crop, was effective for Class III land. It permitted an average soil loss of only 1.3 tons per acre annually for the 4 years of the rotation. But nearly two-thirds of the total soil loss came during the year the field was in cotton, when the loss reached 3.3 tons per acre; and when a third consecutive year of row crop was added to the rotation, the soil loss became prohibitive.

The outstanding results of conservation rotations, especially those based on grass sods, were largely due to the after-effects of the turned-under sod residue. Many measurements of fescue tops and roots to plow depth reveal that between 8 and 10 tons per acre of dry plant material are incorporated with the soil when a good fescue sod is turned under in preparation for planting a row crop. The extensive root system of fescue as well as the top growth decomposed slowly in the soil. The beneficial effects began to disappear in the second successive row-crop year; the runoff trend was upward and the erosion trend was sharply upward after two successive years of row-cropping.

In summarizing the significant results found during the 20 years of tests at Watkinsville, we find:

(1) Runoff and erosion vary greatly from year to year. This variation is closely related to the frequency of occurrence of excessive-rate or "thunderstorm" rainfall. The period of greatest erosion hazard is the summer months when 55 percent of the average annual ersion occurs.

(2) An average of 11 "thunderstorms" each year contain 25 percent of the annual rainfall, produce 56 percent of the annual runoff, and cause 86 percent of the annual soil loss from Cecil soil, capability class IIIe, in continuous cotton.

(3) Sod-based rotations have proven to be by far the most effective cropping system developed in the Piedmont for the control of both runoff and soil loss. They supply practical means for both protecting and improving our soils. They surely will occupy a prominent place in the conservation agriculture of the future in this area.

Browntopmillet for Wildlife

By Morris Byrd and W. C. Young

MORE than 200,000 pounds of browntopmillet seed was harvested in Mississippi, Louisiana, and Arkansas during the 1959 season. This crop is new to these States, but production has boomed as a result of its demonstrated value as a choice food plant for wild ducks. The millet has also been useful as food for bobwhite quail and mourning doves. A few farmers and ranchers have used it for hay.

As recent as 1956 there was no known production of browntopmillet seed in this area. Commercial availability of seed had been erratic because of fluctuating demands. The primary source of seed had been in Georgia. Hence a district program for seed increase to stabilize production and provide a local seed source was started in 1958, and expanded in 1959. It was hoped that the demand for seed in this important duck flyway could be satisfied quickly. Several large plantings of 100 acres or more were sown. Other limited plantings were established by commercial seed growers.

Browntopmillet already was known and used in some areas of the Southeast for hay, grazing, and wildlife, but suitable methods of planting and management were needed for local conditions in Mississippi, Louisiana, and Ar-Arkansas.

In 1957, with seed from SCS plant materials centers, field plantings were made first to test its adaption to soil and climate. The results that year led to increases in plantings for observation of its value for ducks and later for seed production. These phases of its testing have given excellent results.

In the field plantings, widely dispersed over the area, browntopmillet has proven to be suited to the climate and adapted to most

Note:—The authors are plant materials technicians, Soil Conservation Service, of Little Rock, Ark., and Athens, Ga., respectively.

soils. Browntopmillet must be planted where it can be flooded during the winter season for duck use. For bobwhites and doves, any open area is suitable. In the area studied, it has proven adaptable to soil conditions in the Grand Prairie of Arkansas, on the Coastal Prairie soils of Louisiana, on the Delta soils of Mississippi, and on most of the Coastal Plains soils in the three States. Inadequate drainage during the growing season has been the only limitation to successful management.

The crop does not demand heavy fertilization, though some fertilizer was used on most plantings. The fertilizer consisted of 5-20-20 on plantings in the vicinity of Lake Charles, La., at rates of about 100 lbs. per acre; 10-20-10 in the Grand Prairie area, Ark., at rates of about 200 lbs. per acre; and 5-10-5 on forested Coastal Plains of La., at rates of about 500 lbs. per acre. The analyses and rates of fertilizer were those commonly recommended for grain crops in that area. It was observed that on alluvial or more fertile soils, no additional nitrates were needed to produce adequate seed crops. But on the poorer soils, especially of the Coastal Plains, rates up to 100 lbs. of ammonium nitrate per acre were beneficial. Higher rates of nitrogen produced larger and more vigorous vegetative crops, but adversely affected seed yields. For better fertilizing practices both research and local experience will be needed for guidance.

Part of 100-acre planting of browtopmillet on the J. D. McGehee farm in Jefferson County, Ark., that later was flooded for duck food.

A July planting of browntopmillet near Esterwood, La., 44 days after planting.

Observations on time of planting occupied the attention of Service technicians and others in this area during the field planting stages. The plant's response to the length of day will make it seed at the wrong time if the planting date is not right. It was found that June and July plantings were best for this area. An average of 8 fields in 1958 yielded 1,700 pounds of seed per acre in the Coastal Prairie section of Louisiana from plantings in June and July. A July planting in the Bolivar County Soil Conservation District, Mississippi, yielded 2,700 lbs. of seed per acre. August plantings, on the other hand, yielded only 250 lbs. of seed per acre in the vicinity of Little Rock, Ark.

One field of 40 acres in the Lake Charles, La., area was sown by airplane in mid-June of 1958. This same field, after being combine-harvested, was flooded for ducks at the beginning of the season and supported about 7,000 ducks for the first three weeks. It then continued to support about 100 ducks for the remainder of the season. This indicates that seed harvesting can be combined with actual use for wildlife purposes.

All field plantings of browntopmillet which were adequately managed and later flooded for ducks attracted and held them. In a few instances this did not occur until the shooting season was over. However, good hunting was secured on many areas.

Mr. Erle Barham, Bastrop, La., a cooperator with the Northeast Soil Conservation District, planted 16 acres of browntopmillet in 1958, and had 1,000 mallards and good hunting. Examination of the craws of some of the ducks showed they were feeding heavily on the browntopmillet.

Buddy Gayle, Cameron Parish, La., had a 40-acre planting that fed 700 ducks, while a 15-acre field at Sheridan, Ark., supported 200 to 300 mallards for the season. Bill Byers, of Hunter, Ark., counted several hundred doves in one 8-acre field.

Mulch Planting o S

By T. H. Hilliard

Frank Proctor (right) and W. L. Zetterower watch mulch planting of soybeans on Mr. Proctor's farm in Bulloch County, Georgia. The combine in the background is harvesting oats that yielded 90 bushels per acre. The planting is done right behind the combine to get the seed in the ground before the sun dries out the soil, thus giving the beans a chance to emerge before weeds can get started. Planting was completed in this field about 2 hours after combining the oats was finished.

Frank Proctor (left) and E. T. Mullis, SCS work unit conservationist, examine the freshly planted soybeans. The large amount of oat straw mulch checks weed growth in the middles and helps prevent soil moisture evaporation. This mulch is left undisturbed until the last cultivation, at which time it is cultivated to hasten decomposition.

E. T. Mullis (left) is standing in a patch of soybeans that were planted on unmulched land, while Proctor is in an area where there is oat straw mulch. The absence of mulch is the main reason for the terrific weed problem at the left, since planting, cultivation, and fertilization practices were identical. This photo was taken after the second cultivation.

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Frank Proctor (standing), J. T. McAlister, conservation equipment engineer, and E. T. Mullis examine the soybeans after the first cultivation. Notice the absence of weeds in the middles, even though they have not been plowed. Also, notice that soil moisture is just beneath the mulch that was lifted by McAlister, even though there had been no rain for 10 days.

Mullis, Proctor, and McAlister examine the field after it has been "laid by." The middles have now been leveled by plowing, so that the beans may be efficiently combined. The oat straw mulch is in an advanced stage of decomposition.

The soybeans were combined and yielded 30 bushels per acre. This was several bushels per acre more than was made on neighboring fields that were planted in the conventional manner. Mulch planting decreased the cost of planting and cultivation, and greatly reduced soil erosion. Furthermore, it enabled the owner to plant immediately following the oat harvest.

Note:—The photographer and author of this picture story is work unit conservationist, Soil Conservation Service, Glennville, Ga. This sequence of pictures won an award for being the best photographic essay submitted by SCS employees in Georgia during 1959.

Mulching Flood Prevention Structures

By William L. Smith


Spreading hay mulch at a rate of about 4,000 pounds per acre on damsite 1, Deep Creek watershed.

MULCHING flood prevention structures with grass hay to protect the slopes and speed up the establishment of grass cover is a common practice in Texas.

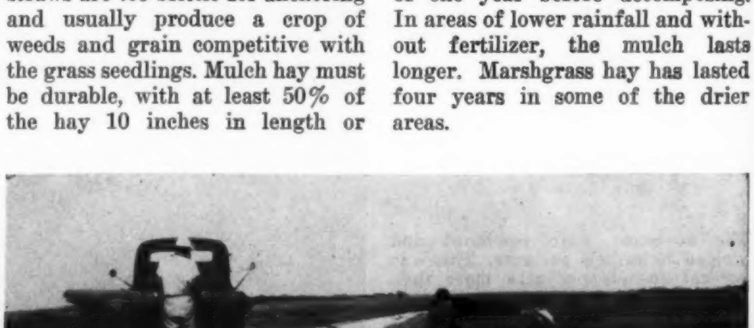
Structures on which grass is established by dryland seeding are mulched prior to seeding. Where grass cover is established by planting vegetative parts of plants such as bermudagrass rhizomes, mulching is not required.

Approximately 81 structures in Texas projects have been mulched to hasten establishment of vegetative cover. The anchored mulch protected against soil loss from immediate heavy rains, and with few exceptions a good stand of grass has been secured without irrigation.

Prairiegrass, marshgrass, Medio bluestem, King Ranch bluestem, and Buffelgrass hays have been the most successful for mulching. Johnsongrass, sorghums, and small grain straws are too brittle for anchoring and usually produce a crop of weeds and grain competitive with the grass seedlings. Mulch hay must be durable, with at least 50% of the hay 10 inches in length or longer. Most hay lasts a minimum of one year before decomposing. In areas of lower rainfall and without fertilizer, the mulch lasts longer. Marshgrass hay has lasted four years in some of the drier areas.

Note:—The author is management agronomist, Soil Conservation Service, Denton, Tex.


A shop-made mulch tiller tool with about 1,000 pounds of rock on it to give necessary weight for pressing hay into the ground.


Anchoring hay mulch with mulch tiller held on the slope by a truck and winch line, Sulphur Creek watershed.

Dam and spillway with newly anchored mulch which has been overseeded with grass, site 2, Sulphur Creek watershed.

The rate of hay mulch usually is about 2½ tons per acre, where anchored. If held in place by strings or netting, 1½ to 2 tons per acre is adequate. The objective is to apply just enough mulch to control erosion and not inhibit the germination of the seed and growth of the grass seedlings.

A good seedbed, free of clods and stones, prepared to a depth of 3 to 4 inches, is necessary so the hay can be anchored into the soil. A tillage tool followed by disking will in most cases prepare a good seedbed. The seedbed should be firm underneath the 3- to 4-inch prepared depth. Breaking with a moldboard or dryland disk plow would normally prepare a seedbed too deep and loose for planting grass.

The hay is spread uniformly over the area to be seeded, usually by hand. When wind velocity reaches 15 miles per hour with gusts up to 20 miles per hour, spreading the mulch becomes impractical. Mechanical mulch spreaders have been used but spreading by hand labor is the common method.

Immediately after the mulch is spread it is anchored by tucking it into the soil with a mulch tiller tool. This implement is a special-purpose tool equipped with flat, sometimes serrated disks, ¼ inch in thickness, 20 inches in diameter, and spaced 9 inches apart. Weight is applied to the frame of the tiller and when drawn slowly across the mulch hay presses it into the prepared seedbed to a depth of 2 to 3 inches.

The structures usually are mulched as soon after construction as possible, regardless of the season of the year. This may be immediately preceding the seeding or as much as 8 months before seeding. The seeding is timed so as to plant only during the optimum planting time for the grasses.

The grass seed is drilled directly into the anchored mulch with as little disturbance to the mulch as possible. A cultipacker drill is used if the seedbed has not been firmed by rain.

The mulch prevents rilling, sheet erosion, and crusting of the soil surface on the dam. It speeds germination of the grass seed and the artificial cover conserves moisture and lowers soil temperature, which helps the small seedlings to survive during hot, dry summer months.

This good grass cover was established in one growing season on a dam in the Cummins Creek watershed. The site was mulched well before the grass was planted.

How to Install a Pipe Overfall

By Larkin B. Agnew

A pipe overfall, as commonly used in conservation work, is a structure placed in the outlet end of a drainage ditch, waterway, diversion, or irrigation water discharge point to drop water safely into a deeper canal or stream. Pipe overfalls in small drainage ditches will be considered in the following discussion.

There are two main advantages to the pipe overfall. First, it prevents gullying in the drainage ditch. Without protection, a ditch may erode from a few feet to several hundred feet back from the main outlet canal. This depends upon the erodibility of the soil, the amount of water carried by the ditch, and the difference in elevation of the ditch and main canal.

The second advantage of the pipe overfall is that it increases the life of the outlet canal. The eroded soil from an unprotected ditch settles in the outlet canal, and forms a silt bar. This silt bar reduces the effective carrying capacity of the canal. A number of unprotected ditches will greatly increase maintenance costs on larger canals.

A pipe overfall structure which a farmer can afford is shown in various stages of construction in the accompanying pictures. This type of overfall is adpated to handle drainage areas up to 300 acres, and a total overfall of 10 to 15 feet. The fall from the bottom of the outlet end of the pipe to the bottom of the outlet canal should be limited to about 6 feet. If the fall is greater, then the overhang of the pipe must be greater and will reach an unsafe length. Additional fall, above 6 feet, should be taken up by adjusting the difference in elevation of the inlet and outlet ends of the pipe.

This pipe overfall installation was made on the C. L. Younger farm near Alexandria, Louisiana. It was installed in the fall of 1959, under the supervision of the Soil Conservation Service, and is the drainage outlet for 273 acres of Red River bottomland. The total cost of the pipe, concrete, anti-seep collar, and reinforcement steel was $498.85. Mr. Younger says that it was money well spent.

A pipe overfall of this type should give many years of trouble-free service if adequate maintenance is provided.

Note:—The author is agricultural engineer, Soil Conservation Service, Alexandria, La.

After proper trenching and grading, the pipe was laid on undisturbed soil. If this is impossible, the fill material should be packed tightly before the pipe is laid on it. Since the bottom of the farm ditch was about 9 feet higher than the bottom of the canal, the pipe was laid with a drop of 3 feet from inlet to outlet end. The anti-seep collar was attached after the pipe was in place. Fill material was tamped tightly around the lower part of the pipe. After this, the remainder of the fill will be made with a bulldozer.

A side ditch, 15 to 20 feet long, was cut from the main outlet canal. Water from the pipe spills into this recessed ditch. The purpose of this recessed area is to prevent damage to the structure by the movement of water and debris in the main canal, and to prevent the overhanging pipe from retarding water flow in the canal.

An important part of a pipe overfall structure is proper overhang of the pipe. The drop from the bottom of the pipe to the bottom of the canal should not exceed 6 feet, as in this installation. The slope of the bank, from the bottom of the recessed ditch to the pipe, should be as steep as can be excavated and still have a stable bank. The water coming out of the pipe should discharge beyond the toe of the slope.

The "island" method of installation was used; that is, the fill directly over the pipe is higher than the ground on either side. Thus, in case of an extremely heavy rain that causes the ditch to overflow, the water will run around either side of the "island" and not wash out the structure. The concrete headwall at the inlet end of the pipe adds stability, cuts down the danger of seepage, allows use of a shorter pipe, and prevents scour around the pipe.

Grass Better Than Wheat

on a Northern Plains Farm

By Walter N. Parmeter

"High-producing beef cattle on good range and pasture land will make a larger net profit than small-grain farming in this area," says Warren Glaus, cooperator with the Brule-Buffalo Soil Conservation District in South Dakota.

During the past five years Glaus has planted 550 acres of his cultivated land to tame grasses, which he uses for hay and pasture. His father started this practice of growing more grass by shifting cultivated land to tame grasses in 1939. Warren now has only 150 cultivated acres which he uses for sorghum and corn silage. His 85-acre wheat base is planted on rented land.

Warren G. Glaus, left, and Larry Kehrwald, SCS technician, examine native grasses on one of Glaus' ranges. Missouri River in the background.

The cultivated land on the Glaus farm has deep soils of medium texture on the uplands, and from medium- to heavy-texture soils in the low areas. The 1,200 acres of native grass range, which lies on the brakes of the Missouri River, has silty clay to dense and shallow clay soils.

Three-year-old Angus heifer with calf in a tame grass pasture on the Glaus ranch.

The cattle are pastured on the cool-season tame grasses early in the spring during calving time, and again in the fall, giving the native grasses ample rest to keep them in excellent condition. Both the native grassland and the tame pastures are divided so that the cattle can be moved often enough to keep the grasses at a height conducive to rapid growth.

Note:—The author is management agronomist, Soil Conservation Service, Huron, S. Dak.

"I like to plant 4 pounds of crested wheatgrass, 4 pounds of smooth bromegrass, 4 pounds of alfalfa, and 2 pounds of sweet clover in my mixture of tame grasses," says Mr. Glaus. In many of his tame grass pastures the crested wheatgrass is now predominant, with a sprinkling of alfalfa and some bromegrass in the low areas, while the sweet clover has almost disappeared.

"By good pasture management I have not had to replant my grasses and I have little worry about drought, as there is always plenty of pasture and hay to carry my herd," Warren states. He plans to carry about 150 Angus cattle, of which half will be registered livestock and the rest commercial cattle on which he will use purebred bulls.

Mr. Glaus is now a director of the South Dakota Livestock Production Record Association.. Through this association he culls the lower one-sixth of his herd each year and puts them on the market. The association requires that each new calf be ear-tagged with a number, date of birth, and the number of the dam. The calves usually are weaned in about 190 days, at which time each calf is weighed and the weight is averaged to get the rate of gain. The calves that have made the best gain and the cows that produced these calves are the ones that remain with the herd. A cow is kept until it no longer produces a calf with ability to make rapid gains. Type is also considered at the time the calves are selected. Those calves of poor type are discarded even though they have made a good gain.

The Warren Glaus farm was one of the first farms in South Dakota to come under the Great Plains Conservation Program. His plan includes terracing, cross-fencing for better pasture management, and tree planting, together with dams and dugouts to better utilize the pastures.

Better Woodland Through Water Control

By Edwin C. Wilbur

THE Lower Neches Soil Conservation District in southeastern Texas has taken the lead in showing how water control can be applied to woodlands where excess water is a major problem in the production of wood products.

There are 527,000 acres of woodland in the Lower Neches district, mostly in private ownership. A recent conservation needs survey showed that excess water was a major problem on approximately 409,000 acres, or 70 percent of the total agricultural land in the district.

The Dishman-Lucas Estate became a cooperator with the district in February 1957. A request for technical assistance was made by Mr. Phillip Lucas, who stated that the main problem on his woodland tract was drainage. The complete soil and water conservation plan developed by SCS technicians and Mr. Lucas included a water control system for the 2,260-acre woodland tract.

Prior to 1957, this woodland tract was a cutover stand of mixed hardwoods and scattered pine. Surface water covered most of the tract for 4 to 5 months out of the year to a depth of 6 or 8 inches. Natural pine reproduction was drowned out and planting of seedlings was impractical.

Logging operations were hazardous and expensive because of flooding. The pine, gum, and other

Note:—The author is woodland conservationist, Soil Conservation Service, Rosenberg, Texas.

Primary water control ditch on the Dishman-Lucas woodland tract.

merchantable species were showing little or no growth.

That was the situation before a planned woodland water control system was installed. Today part of the tract has been drained, undesirable hardwoods have been deadened, and pine seedlings have been planted in the openings to insure a fully stocked stand of pine for future timber harvests.

The first step was to clear a right-of-way for construction of drainage ditches. About 12 acres were cleared at a total cost of $1,200. All the primary ditches were designed 4 feet wide at the bottom and 2 feet deep with 2 to 1 side slopes. The ditches were built with a dragline at a cost of 20 cents per cubic yard. A total of 7,887 cubic yards of dirt was moved in the construction of 20,275 linear feet of ditches.

Structures were built to stabilize water levels and control surplus surface water on some 800 acres at a cost of $3.75 per acre. The remaining acres in the tract will be similarly treated.

The intensity of water control needed on woodland is not nearly so great as on cropland. Primary ditches were spaced from 1,000 to 1,300 feet apart. Internal drainage developed naturally and laterals were used only where there was an obvious need.

Since the water control system was installed on the Dishman-Lucas woodland tract in July 1958, many benefits have been noted by foresters, technicians, and numerous landowners who have studied the operation. The main advantages noted were:

Dirt removed in ditching operations were piled in such a manner that openings are left approximately every 100 feet, permitting lateral movement of water into the ditches.

Water control makes it practical to install woodland management

Slash pine plantation on the Dishman-Lucas Estate. All trees are the same age; but those on the low, wet area in the foreground are only 3 to 4 feet tall, while those on better drained land in the background are about 12 feet tall.

practices and increases accessibility for logging operations.

The ditches serve as excellent firebreaks and divide the woodland acreage into workable management blocks or compartments.

The water control work has benefited wildlife. Removal of surface water has improved the natural habitat for wildlife by providing better sources of food and cover for all kinds of native wildlife. Ducks, particularly mallards and woodducks, are attracted to natural ponds in the woodlands which have acorns, cypress seeds, smartweeds, and other kinds of desirable food.

The most important benefit of water control, however, is that it makes possible the growing of a better class of timber.

John M. Bryant of California

JOHN M. "Jack" Bryant farms about 1,200 acres of rich southern California farmland in the Imperial Valley. A native of Eureka, Calif., Jack spent most of his early years in northern California and southern Oregon. He came to Imperial Valley in 1926 to work as a fruit packer. In 1930 Bryant rented some land and started farming on his own on a small scale. His first land purchase was made in 1935—80 acres near Calipatria.

In addition to personally overseeing his extensive farming operations, Jack has taken an active part in soil conservation and civic affairs in his home town of Calipatria and Imperial County.

John M. Bryant at a water control structure in one of his irrigation ditches.

He has served since March 1949 as a member of the board of directors of the Imperial Irrigation District, one of the largest irrigation districts in the world, and as board president since April 1957. He recently was elected Chairman of Area 8 of the California Association of Soil Conservation Districts. He served as a member of the Agricultural Stabilization and Conservation Committee for 4 years.

The Imperial Irrigation District acts essentially as a soil conservation district. Members of the irrigation district board of directors serve in a dual capacity as soil conservation district directors.

Within the area of the Imperial Irrigation District there are about a half million acres presently under irrigation. The district is a "tail-end" irrigation system. Upstream on the Colorado River irrigation projects remove fresh water and return drainage water to the river. Thus as the river flows south the salt content increases. Water reaching Imperial Valley farmland carries about a ton of salt per acre-foot.

Jack said, "Salinity is our major problem. Local farmers realize that tile drainage is our only solution. The more tile we get in the ground, the better we will be able to leach out harmful salts."

A pioneer in the installation of tile, Jack was foreman for a rancher who brought the first tile-trenching machine to Imperial Valley in 1932. Since that time about 7,200 miles—38 million feet—of tile have been installed under about 250,000 acres of land. A tile machine has recently been developed for Imperial Valley contractors that will lay a 24-inch tile line 12 feet deep at the rate of 600 feet per hour.

All of the 1,200 acres that Bryant farms are now under a soil conservation plan, with the following practices installed: 6 miles of concrete ditch using a gravity flow; 40 miles of 4-, 6-, and 8-inch tile drain installed at an average depth of 6 feet; and all 1,200 acres stake-leveled for good water management.

About 3 miles of concrete ditches on Jack's property have small drops installed to slow down the flow of water. Water is siphoned from the ditches by using 20 to 25 1¼-inch metal siphons between drops.

Normally his crop rotation is alfalfa, barley, flax, and cotton. Alfalfa usually stays on for three years. All his land is planted to a green manure crop every 6 years. Jack uses Sesbania (hemp) which grows to about 6 feet and is plowed under.

At the present time he is growing 640 acres of alfalfa, 80 acres of sugar beets, 320 acres of Delta Pine cotton, and 160 acres of blue panicum grass as permanent pasture. Jack averaged 3.74 bales of cotton an acre in 1959, and will pasture between 7 and 8 head of cattle per acre on the blue panicum. He averaged 5 to 6 tons of hay per acre plus pasture on his alfalfa and 25 tons with about 16 percent sugar on his beets last year.

His foreman has worked for him for the last 14 years. In addition, he employs two tractor drivers and two irrigators on a full-time basis. Crews of Mexican contract laborers, known as braceros, are brought in from time to time to thin and harvest crops.

—Alex Gay

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Mr. S. B. Huff, chairman of the board of supervisors of the Greenville Soil Conservation District (S. C.), recently said: "I don't see how a farmer can sit on a front seat in church on Sunday and then go out in his field on Monday and plow up and down hill."

Early Streambank Stabilization

By Paul Tabor

A description of streambank stabilization given in 1776 by Dr. James Anderson of Scotland should be interesting to those engaged in modern watershed work. It consisted of sloping unstable streambanks, above and below the waterline; sodding or seeding the slope above with grass; and planting aquatic vegetation at and below the waterline. The method is given in his *Essays Relating to Agriculture and Rural Affairs,* 5th edition, volume 1, pages 121-129, published in London in 1800. His description follows (non-essential portions have been omitted).

"It frequently happens that when a river runs in a bed of rich vegetable mould, the least accident that may chance to divert the stream towards any particular part of the bank, causes it to sweep away large tracts of fine ground.....If you carefully observe the banks of rivers, you will readily remark that these ravages are always most considerable....where the bank rises perpendicularly to a pretty considerable height....the first and most necessary step toward a cure is to level down the edge of the bank that is next the water, so as to make it slope gradually down toward the river.....This operation ought to be performed as early in summer as possible; and the slope should be either immediately covered with turf....or....sowed very thick with the seeds of some small mat rooted grass . . .

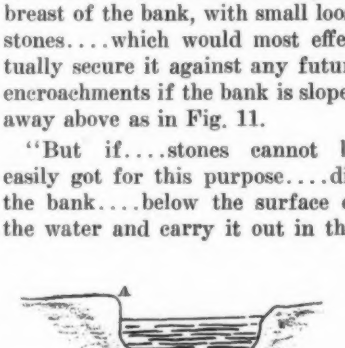
"If the stream has not been extremely rapid at the foot of the banks, some of the earth that was thrown into the water will....form a bed of loose soft earth....The surface of this....ought to be instantly stuck full of the roots of bog reeds, flags, water spiderwort, rushes and other mat rooted aquatic plants; which if allowed to remain till they have once struck root, will afterwards form a barrier that nothing will ever be able to destroy. (See Fig. 8, which represents a river with a high bank A; and Fig. 9, where the same bank is cut into a slope, and part of it thrown into the river, and aquatic plants growing thereon at B.)

"But if the stream be too rapid to admit of this, and the bank of soft earth is much deeper than the surface of the water (as in Fig. 10) it will be of great use to fill up the breast of the bank, with small loose stones....which would most effectually secure it against any future encroachments if the bank is sloped away above as in Fig. 11.

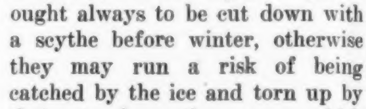
"But if....stones cannot be easily got for this purpose....dig the bank....below the surface of the water and carry it out in this way a considerable distance, and then stick the whole surface.... below the water, full of mat rooted aquatic plants, strewing it over . . . with a thin bed of small gravel or sand.....

"This bank ought to continue to shelve downwards, even where it is below water, as at Fig. 12; and those aquatics that will grow in the greatest depth of water, ought to be planted on the innermost brink, and others behind them.....

"N. B. where the current is considerable, these aquatic plants ought always to be cut down with a scythe before winter, otherwise they may run a risk of being catched by the ice and torn up by the roots when a thaw comes, which would give access to the water and endanger the embankment."



Note:—The author is plant materials specialist, Soil Conservation Service, Athens, Georgia.



THE CONSERVATION OF NATURAL RESOURCES. By Richard C. Haw. 225 pp. 1959. Faber and Faber, Ltd.: London. 30s.

TO realize what this book must mean to conservation-minded people in Africa, you would have to close your eyes and imagine yourself a bush farmer with a large family—or a tribal chieftain with a hungry tribe—and the desert stealthily slipping up on you. It is the Dark Continent's first and, thus far, only textbook on conservation of land resources. In addition to being a first text, it is a good one, and it fits Africa.

For American readers, the book's outstanding feature is its skillful simplification of the technicalities and scientific findings that have gone into chapters describing soil and water conservation methods suited to African land problems.

Emphasis is on fitting mechanical practices to topography, rainfall, soil permeability and depth, and keeping the soil covered by all vegetative practices possible in dry regions. A special treatment of good land use, including veld management, rotations, leys and strip-cropping, and tillage with mulching to keep the soil's organic matter content as high as possible, is well handled from the standpoint of experiences in the Rhodesias and South and Southwest Africa.

The farm plan, as a guide to both land use changes and future development of virgin land, is treated very simply in conjunction with land classification and basic map requirements. This section is credited to the U.S. Soil Conservation Service's Survey Division and the Department of Conservation of Rhodesia.

An appendix lists conservation uses of more than 300 trees, shrubs, legumes, and grasses for conservation purposes in Africa's warm and arid regions. The text also contains 36 photographic illustrations and 35 diagrams for pictorial explanation of mechanical structures, field designs, and land study tools.

The first chapter, although only a few pages, is somewhat of a gem of beautiful writing. It starts with the statue of Cecil John Rhodes in the Cape Town Gardens, pointing northward—"There is your hinterland." It treks through the Union, the Federation of the Rhodesias and Nyasaland, Mozambique, the Congo, Kenya, Uganda, Sudan, Egypt, pointing to dying land. "These are the stimuli for this book. Africa can still be saved, and is worth saving." We hope Mr. Haw's book travels all the way, and we think it will have an important part in showing more and more Africans the responsibilities awaiting them with regard to their vast land. The text also can be a valuable reference in other countries with conditions similar to those of Africa.

—Phoebe Harrison

THE NATURE AND PROPERTIES OF SOILS. By Harry O. Buckman and Nyle C. Brady. 567 pp. Illus. Sixth edition, revised. 1960. Macmillan Company, New York. $7.95.

A new edition of the classical Cornell text on soil science is always welcome. For nearly 40 years this has been a standard text in most American colleges for the first course in soil science, commonly presented in the sophomore year.

Through the years the authors have been able to write soundly on the basis of the results of scientific experiment and still not overreach college sophomores. The revisions for this edition are chiefly in the discussions of soil water, nitrogen, pH, micronutrients, weathering, clay minerals, and soil survey.

With our continually expanding knowledge of basic soil science and of the soils of the world the task of maintaining a proper balance without undue length has become increasingly difficult. Probably none of us would have handled the problem in the same way. This reviewer, for example, could have wished for a bit more about the management of tropical and desert soils. Yet few, if any, of us could have done better for the majority of American students.

Certainly this 6th edition will continue the distinguished record of service to those beginning in soil science.

—Charles E. Kellogg

MANUAL FOR OUTDOOR LABORATORIES: The Development and Use of School Grounds and Outdoor Laboratories for Teaching Science and Conservation. Edited by Richard L. Weaver. 84 pp. Illus. 1959. The Interstate Printers and Publishers, Inc.: Danville, Ill. $1.25.

Here's a new and practical book, the second in a series for teachers and conservation leaders put out by the Conservation Committee of the National Association of Biology Teachers.

The first in the series, also edited by Dr. Weaver, was "The Handbook for Teaching Conservation and Resource-Use."

This new manual contains 16 articles giving suggestions for teaching science and conservation. Teachers of the middle and upper elementary grades and high school will find it helpful, as will leaders of youth groups.

The well-illustrated manual describes ways and means of establishing outdoor laboratories, features to emphasize, and the use that can be made of the areas. For example, it contains suggestions on how to have a school garden, how to erect a weather station, and how to plan better outdoor laboratories.

Dr. Weaver's article, "Schools Unlimited: Suggestions for Tomorrow's Progress," has plans for schoolground laboratories and points out the need for erosion control and soil study. It urges community cooperation.

An article by Albert B. Foster tells how a science teacher at Belle Valley High School in southeastern Ohio solved school water problems and created an outdoor laboratory.

Other articles include "Landscaping a School to Attract Wildlife," by Frank V. D. Cortelyou; "Preparing for a Land-Use Survey of School Grounds by a Biology Class," by John W. Brainerd; and "School Ponds for Biology Teaching," by Henry R. Russell and John W. Brainerd.

"The Broad Creek Conservation Program," by George P. Graff, will be of interest to leaders of youth groups. It tells how more than 2,600 Boy Scouts and Explorers were introduced to conservation during an 8-week summer camping season.

—Adrian C. Fox

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CONSERVATION NEEDS INVENTORY

The National Inventory of Soil and Water Conservation Needs is the most comprehensive, cooperative effort ever undertaken to determine facts about the Nation's land resources and need for conservation treatment. In 1956 the Secretary of Agriculture directed eight Department agencies with responsibilities in land use, soil, water, forest and woodland, and pasture and range conservation to conduct the Inventory.

Committees were organized in the States to guide and direct local committees in the development of the Inventories in the 3,000-plus counties of the United States. In addition to the Department of Agriculture agencies, other Federal, State, and local agencies had membership on the State and county committees. Thus, the Inventory estimates include local thinking as to conditions and trends.

The Inventories were completed in all States early in 1960. The Department Committee is in the process of reviewing the Inventories for comparability and consistency within the States and counties. Many of the States are expected to publish Inventory results before the end of 1960, and complete Inventory results for the Nation will be available in early 1961.

The kind of information that will be available from the completed Inventory includes: (1) Basic data in tabular form for each county that show kind of soil, slope, erosion, and land use. State summary tables are also being prepared. (2) Present (1958-59) and expected land use (1975) by land capability subclasses for each county and State totals. The land use classification will be for cropland (irrigated and non-irrigated in 17 Western States), pasture and range, forest and woodland, and "other." (3) Acreage of cropland needing treatment and feasible to treat by dominant kind of problem; i. e., erosion, water, soil, and climate (irrigated and non-irrigated separated in the 17 Western States). (4) Pasture and range needing treatment through seeding, management, water developments, and water conservation. (5) Forest and woodland needing establishment, improvement, protection, and/or management of timber stand, and establishment of windbreaks and shelterbelts. (6) Other land needing treatment: same type of data as for cropland. (7) All watersheds in the United States delineated to 25,000 acres or less (some 15,000) with problems that are applicable under the small watershed act. Data will show kind of problem and whether or not "project action" is required for solution of these problems.

The information obtained from the Inventory will be used in planning and carrying forward the many conservation and land use activities of local, State, and Federal agencies and groups as well as individuals.

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Productivity of farm workers in the United States is growing more than twice as fast as that of industrial workers. Since 1950, output per man-hour in non-agricultural industry has risen about 2 percent a year; in agriculture it has risen 5 percent per year.

◆

Farm capital investment per worker last year averaged $20,700, compared with an average of $15,300 per worker in manufacturing. On highly mechanized farms in the Corn Belt, average investment was even higher.

◆

In minimum tillage tests conducted by the Ohio Agricultural Experiment Station, corn yields from minimum-prepared seedbeds were equal to or greater than those from conventional seedbeds, and soil losses were much lower.

◆

Barley seems to be more susceptible to soil acidity than other small grains, according to research conducted by agronomists at the Virginia Experiment Station. They recommend a pH of 6.0 to 6.5 for barley.